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ABSTRACT

The effects of message structure, required recall structure, and receiver apprehension on the recall of message information were studied in a 2 x 2 x 2 factorial analysis of variance with fixed effects. Subjects were 238 college students who scored either high or low in communication apprehension. A category clustering scheme was used to manipulate message structure and required recall structure. The results indicated an interaction between message structure and recall structure. Although neither of these two factors affected recall independently, message structure superiority was contingent upon recall structure. There also was an effect for receiver apprehension, with low apprehension receivers recalling more than high apprehension receivers. The hypothesized three-way interaction between message structure, recall structure, and receiver apprehension did not occur. (RL)

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THE EFFECTS OF MESSAGE STRUCTURE, REQUIRED RECALL STRUCTURE, AND RECEIVER APPREHENSION UPON RECALL OF MESSAGE INFORMATION

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Summary:

This study investigated the effects of message structure, required recall structure, and receiver apprehension upon recall of message information. The analytical model was a 2 x 2 x 2 factorial analysis of variance with fixed effects.

Previous researchers have used a category clustering scheme to impose over the same message content two highly-organized structures which differ in type but not in degree of category clustering. Some studies have found differences in recall effects for such structures, while others have not. Other researchers have suggested superiority of a message structure may be a function of the task-demand the auditor performs with the message information. This study operationalized both structure factors with a category clustering scheme for the primary purpose of investigating a hypothesized interaction between message structure and required recall structure.

Receiver apprehension has been presumed to involve information-processing capabilities. A secondary purpose of this study was investigation of a hypothesized effect for receiver apprehension upon recall and a hypothesized interaction of message tructure, required recall structure, and receiver apprehension.

Results indicated a message structure x recall structure interaction. Neither of these two factors affected recall independently; message structure superiority was contingent upon recall structure. There was also an effect for receiver apprehension, with low apprehension receivers recalling more than high apprehension receivers. However, there was no message structure x recall structure x receiver apprehension interaction.

THE EFFECTS OF MESSAGE STRUCTURE, REQUIRED RECALL STRUCTURE, AND RECEIVER APPREHENSION UPON RECALL OF MESSAGE INFORMATION

RATIONALE

During the past two decades, a number of studies in the fields of speech communication and educational psychology have demonstrated generally that well organized messages are superior to disorganized messages in their effects upon recall of message information. The circumstances under which a particular message structure has relatively more efficacy than another have yet to be clarified. Friedman and Greitzer have argued, ". . . in determining the effectiveness of a particular (input) organization, it is important to look carefully at the information-processing demands of the task and how those interact with the subjects' information-processing capabilities."[1] This study investigated the effects of message structure, required recall structure, and receiver apprehension upon the recall of message information as one approach to addressing the implications in that statement.

It has been specifically suggested by Whitman and Timmis that the effectiveness of a given message structure may be contingent upon the task which the auditor is to perform with the message information.[2] Given that suggestion, this study employed two types of required recall structure as a method of varying the task and examined them conjunctively with two types of message structure. The primary interest in the study was a hypothesized interaction effect for message structure and required recall structure which would reflect the contingency relationship suggested by Whitman and Timmis.

Receiver apprehension was included as a factor related to information processing capability in order to determine whether this variable would interact with message structure and required recall structure, with the additional purpose of assessing the predictive validity of the instrument used to measure receiver

apprehension. In order to explicate the nature of the research hypotheses in this study, the rationale has been developed with reference to each factor in the design.

Message Structure

Research on the effects of message structure has developed under at least two models largely associated with the fields of speech communication and educational psychology. With the possible exception of Darnell,[3] studies in speech communication have assumed hierarchical superordinate-subordinate relationships among sentences in a paragraph. Studies by Beighley in 1952[4] and 1954[5], Thompson in 1960[6] and 1967,[7] Johnson[8] and Baird[9] have typically accepted messages as organized on the basis of raters' appraisals and compared these organized versions to disorganized versions derived by randomizing sentences and/or paragraphs, using multiple-choice tests in order to assess recall of message information. With exception of Beighley, who found no structure effect, and Darnell, whose results were not entirely consistent with predictions, these studies have generally found a superiority for organized messages.

The literature of educational pyschology contains a line of research on written prose materials where message structure is operationalized in terms of a category clustering index[10] and free recall is employed to assess the degree of learning and to provide a conceptual basis for explaining this learning. Friedman and Greitzer,[11] Schultz and DiVesta,[12] Perlmutter and Royer,[13] Myers, Pezdek, and Coulson,[14] and Frase[15] have all used some form of this procedure in assessing the effects of structure upon learning. Whitman and Timmis,[16] Whitman,[17] and Daniels[18] have more recently used this model in the field of speech communication with orally-presented messages.

The category clustering index is applicable only to a certain model of the message. The message must be generated out of a matrix with column headings consisting of concept names, row headings consisting of attributes associated with each concept and matrix elements consisting of attribute values. There are as many sentences in the message as there are elements in the matrix, with each sentence in the message expressing a relationship between a concept name and an attribute in terms of the attribute value. These sentences may be arranged in category clusters created by concept or by attribute, or the sentence order may be randomized (see Table 1). The category clustering index is then employed to quantify the degree of structure present in the message.[19]

Some of the studies in this area (Schultz and DiVesta, Perlmutter and Royer, Myers, Pezdek, and Coulson, and Frase) have examined the differential effects of messages structured by concept, by attribute, and by randomization upon free recall. Friedman and Greitzer compared only messages structured by concept and attribute, with free and cued recall as dependent variables. Whitman and Timmis examined a form of concept structure against a random version with three levels of cued recall as dependent variables.

Studies involving tests of high-structure messages against random versions have consistently shown a superior recall effect for the high-structure versions. Some results suggest that messages structured by attribute are superior to those structured by concept in effects upon recall accuracy (Perlmutter and Royer, Friedman and Greitzer), while others have indicated there is no difference between the two forms of structure in accuracy effects (Frase, Schultz and DiVesta). Myers, Pezdek, and Coulson argued for the superiority of the attribute structure, but obtained conflicting results in their studies. In one experiment, the attribute structure was superior to the concept structure, but the two were equal in effect in a second experiment. In a third experiment,

attribute structure was superior to concept structure in sequential recall (i.e., where recall was required in the same order as the input order), but the two were equal in free recall.

Any conclusion which suggests that one high-structure type is superior to another high-structure type seems premature in the face of conflicting results. Moreover, studies which have found such differences are subject to interpretive limitations. Perlmutter and Royer based their conclusion upon a structure x trial interaction in which attribute structure superiority was present only on later trials. While Myers, Pezdek, and Coulson found attribute structure superiority for sequenced recall, the criterion was scored in such a way that it amounted to free recall. Friedman and Greitzer, as noted, argue that such conclusion should not be made apart from assessment of message structure interaction with task demands and subject capabilities.

Required Recall Structure

Most of the studies cited so far used dependent variables involving cognitive abilities at the lowest levels of Bloom's Taxonomy (e.g., simple recall).[20] Frase included application ability as a dependent variable, but deemphasized it in his analysis. Whitman and Timmis attempted to sample the range of cognitive abilities with three hierarchical criterion measures and found significant message structure effects upon all three. However, they still questioned whether ". . . some structures (are) a priori superior to others, or is the superiority of a structure determined by its ease in facilitating some type of task accomplishment?"[21]

One way of examining this question is to vary the structure of the task itself while varying message structure. At least one study (Perlmutter and Royer) did this in the context of required recall order. There was no effect for recall order, nor did it interact with message structure. However, subjects

were simply told that information was to be recalled in a certain order; there was no control to insure this would occur and the authors noted that some subjects ignored the instructions, executing recall in an order other than that specified.[22]

Given the results of previous research, this study assumed that message structures or required recall structures differing in type of category clustering would not, in and of themselves, produce differential effects upon recall, providing that these structures possessed the same degree of category clustering. However, message structure and recall structure should interact, with superior recall occurring in conditions where message structure and recall structure are compatible (i.e., of the same type).

Receiver Apprehension

Communication scholars have been concerned with the phenomenon of apprehension in communication for more than three decades.[23] However, Wheeless has noted that the focus has been upon source apprehension with little concern for receiver apprehension, which should have a direct impact upon the receiver's information-processing capabilities.[24] Indeed, a recent issue of Communication Monographs was largely devoted to the subject of oral communication apprehension as investigated in research by Beatty, Behnke, and McCallum,[25] McCroskey,[26] and Daly.[27] These reports were primarily concerned with apprehension experienced by one relevant to engaging in oral message delivery, i.e., source apprehension.

The literature of anxiety theory delineates a relationship between anxiety and information-processing in task performance. Sinclair[28] and Spielberger[29] have discussed various studies which suggest that anxiety tends to facilitate performance on simple tasks while interfering with performance on complex tasks. As noted by Spielberger, the studies relevant here have regarded anxiety as a trait, with subjects classified as high or low in anxiety on the basis of a personality questionnaire such as the Taylor Manifest Anxiety Scale.[30] It has

also been noted that performance differences between high and low anxiety trait subjects occur most often in situations involving some degree of stress, ego involvement, or risk of failure.[31]

While anxiety research has been employed in explication of the communication apprehension construct, the relationship between trait anxiety and communication apprehension remains unclear in the literature of speech communication. While Porter[32] argued that communication apprehension involves fear rather than an "irrational, personality-trait, or pathological" form of anxiety, Beatty, Behnke, and McCallum stated, "The theoretical foundation of communication apprehension is a trait conceptualization of speech anxiety."[33] Yet, these same authors concluded that their own research in this area failed to support a conceptualization of communication apprehension as a personality trait.

In his initial treatment of receiver apprehension and development of the RAT, Wheeless adopted and extended Porter's arguments in this area, noting that ". . . receiver apprehension appears to be more of a fear or phobic reaction than a generalized anxiety."[34] Later, Wheeless and Scott revised the RAT and reconceptualized the construct. In explaining the relationships between the concepts of apprehension, fear, and generalized anxiety, Wheeless and Scott stated:

> "State anxiety, which Spielberger equates with fear, is related to specific things, events, and situations which can be designated . . . Trait anxiety, equated with generalized anxiety, is related to a generalized activation level or trait of the individual which applies across a broad spectrum of situations . . . . Receiver apprehension can be conceptually summarized as a fearful, but not necessarily understood reaction to information processing in both specific and general situations."[35]

While this position appears to distinguish receiver apprehension from anxiety, per se, the issue raised by Beatty, Behnke, and McCallum in connection with communication apprehension generally may be extended to receiver apprehension as well. These authors concluded that it is unclear whether self-report

measures of communication apprehension reflect a trait or whether such measures are better conceived of as state indices of apprehension.

Spielberger has also noted that state anxiety involves a transitory response to stress occurrring in the here and now, while trait anxiety involves a latent, acquired behavioral disposition to respond in a certain manner, given a stressful stimulus.[36] The revised RAT (RRAT) asks the respondent for a self-report of how he or she usually responds to specific and general situations. Does this report reflect acquired behavioral dispositions to respond under stressful circumstances (trait) or a report of past transitory response to stress (state at the time of exposure), either of which might be used to predict future response under similar stressful circumstances?

The answer to this question seems uncertain, yet relationships between receiver apprehension and such variables as double-bind factors, attitudes, satisfaction, sex, and educational level have been investigated by Scott and Wheeless,[37] McDowell and McDowell,[38] and Nida.[39] While Wheeless and Scott[40] have reported evidence which indicates that receiver apprehension is related to information-processing capability, McDowell and McDowell have called for additional research to determine the relationship between receiver apprehension and comprehension.

Given the theoretical elaboration of receiver apprehension and research results reported by Wheeless and Scott, it was expected in this study that receiver apprehension would affect recall of message information. Moreover, if message structure interacts with required recall structure to produce inferior recall in conditions where the two structures differ, such conditions would constitute a more complex task environment than conditions where the two structures are the same. If one assumes that receiver apprehension constitutes a trait, the same reasoning derived from drive theory to predict an interaction

between trait anxiety and task complexity may be extended to predict a message structure x recall structure x receiver apprehension interaction where high apprehensives' level of recall would be more adversely affected under complex conditions than recall for low apprehensives, the former tending moreso toward task-produced competing response tendencies. No interaction, however, would be expected between receiver apprehension and message structure or recall structure alone as operationalized in this study.

Hypotheses

Three research hypotheses may be drawn from the theoretical focus in this study. They are directionally stated in accordance with a priori predictions of outcomes. While other tests may be generated from the research model itself, they are not addressed, since there is little or no theoretical basis for expecting effects relevant to these tests. The three research hypotheses are as follows:

1. Message structure and required recall structure will have an interaction effect upon recall of message information. Specifically, recall will be lower in conditions where message and required recall structures differ than in conditions where they are the same.

2. Low apprehension receivers will recall more message information than high apprehension receivers.

3. Message structure, required recall structure, and receiver apprehension will have an interaction effect upon recall of message information. Specifically, recall by high apprehension receivers will be disproportionately affected in an adverse manner in conditions where message and required recall structures differ.

METHODS

Subjects

The investigators initially recruited 413 volunteer undergraduates from introductory courses in interpersonal communication and public speaking at

a midwestern university. In accordance with current standards governing the use of human subjects in research, students in the classes were informed of the study's basic purpose, known risks, and possible benefits, then asked to sign a participation consent form.

Students volunteering to participate as subjects were given the Revised Receiver Apprehension Test (RRAT) developed by Wheeless and Scott.[41] This instrument has been shown to correlate moderately with the Eysenck Neuroticism Scale, a scale purported to be a valid measure of anxiety.[42] Data obtained from this administration of the RRAT yielded a reliability coefficient of .79 (coefficient alpha).

Of the 413 RRAT respondents, 238 with scores in the top (n = 122) and bottom (n = 116) 27% of the RRAT were categorized as high (HA) or low (LA) in receiver apprehension, then randomly preassigned to levels of the two active variables (message structure and recall structure). Treatments were executed two weeks after the RRAT administration. Attrition occurring during that two week period reduced the number of subjects actually receiving the treatments to 70 in the HA category and 66 in the LA category. While individual cell sizes ranged from 14 to 22, it is important to note that the percentage of attrition was virtually identical for the HA and LA categories. Thus, the representation of background populations in these groups was not distorted by attrition during the time lapse between recruiting and treatment.

The remaining 175 respondents with scores in the middle 46% on the RRAT were also randomly preassigned to conditions and permitted to participate in the study, since bonus points toward final course grades were awarded for the act of participation. However, data from this latter group of subjects were not included in the hypothesis tests reported for the results section of this study; only the HA and LA subjects were dealt with in this analysis.

Materials and Variables

The materials used in this study were developed from a situation encountered by one of the investigators in the context of hospital procedures in administering treatments to patients. Nurses involved in treatment administration were executing tasks organized by time, but the information required to perform the tasks was organized by patient. It was felt that this situation could be adapted for a test of the message strucuture x required recall structure interaction hypothesis in terms of the category clustering organizational schemes employed in previous studies.

Sixteen syntactically identical sentences were written which described treatments to be administered to four patients over four times. Each sentence contained a time (8:00, 9:00, 10:00, or 11:00), a patient name (Patient One, Patient Two, Patient Three, or Patient Four), and a treatment (W, X, Y, or Z). At each time, each patient received one of the four treatments. For example, "At 10:00 a.m., Patient One receives Treatment Z."

Two message structures were formulated from these sentences. The structures differed in type of category clustering, but both possessed the same degree of category clustering.

The first message structure (PM) used category clusters created by patient name. Each patient name constituted a category and a new category was not introduced until all elements in the preceding category had been presented, i.e., sentences were ordered in the message such that patient name did not rotate until all four treatments for the patient had been presented in temporal sequence. This message had a category clustering index of 100% (maximum unity) by patient name.

The second structure (TM) used category clusters created by time. Here, each of the four times constituted a category. Again, a new category

was not introduced until all elements in the preceding category had been presented. Thus, time did not rotate until all four treatments at that time had been presented in order of patient name. This message had a category clustering index of 100% by time.

Both messages consisted of four categories, with each category containing four sentences. The time sequence (8:00 - 11:00) was the same in each category of the PM message and the patient name order (One - Four) was the same in each category of the TM message. Each treatment value (W, X, Y, and Z) appeared once and only once in each category of both messages.

Required recall structure was also operationalized at two levels. The structure of the first level (PR) was identical to the structure of the PM message. The structure of the second level (TR) was identical to the structure of the TM message. Within each structure, the criterion for recall of message information was recall of the specific treatment being administered to a given patient at a given time through response to a completion-type item. For example, "At 10:00 a.m., Patient One receives Treatment _____."

Each recall structure contained 16 such completion-type items accounting for all 16 treatments, i.e., there was one test item for each message sentence. Each item required recall of the treatment value contained in its corresponding sentence. Each item was printed on a separate page of a test booklet. The item order in the PR test booklet followed the sentence order in the PM message and the item order in the TR booklet followed the sentence order in the TM message. Tests were scored for the number of items correctly recalled. To avoid reordering responses in one of the recall structures, reliability was assessed separately for the PR

and TR conditions. Coefficients of internal consistency (KR 20) were .79 in the PR condition and .76 in the TR condition.

Design Summary

This study employed a 2 x 2 x 2 factorial design with fixed effects. The three factors were message structure (PM and TM), required recall structure (PR and TR), and receiver apprehension (HA and LA). The dependent variable was recall of specific information contained in the message.

Procedures

The PM version of the message was taped on high-quality recording equipment by a reader who possessed professional vocal characteristics. The TM version was created by edit-dubbing the PM version into the TM structure on a new tape. No audibly discernible differences in reproduction quality between the two tapes were evident to the investigators, nor to a graduate student with a background in audio engineering. Within-sentence characteristics and between-sentence pauses were the same for both tapes.

Treatments were administered on two consecutive evenings, with each subject being treated at one of the two sessions. Treatments occurred in two adjacent lecture rooms which were similar in size, arrangement, and atmosphere. Seats in each room were divided in two clearly marked sections. As subjects reported, they were directed to their preassigned rooms (PM or TM message) and sections (PR or TR recall). After all subjects were seated, a final check was made to insure that each subject was in the correct room and section. Test booklets were distributed with an instruction not to open them until told to do so.

Subjects were then given oral instructions by the room proctors. They were urged to listen carefully to the message, not to disregard any information, and not to open test booklets until so advised. Each taped message contained an introduction to set a frame of reference for the information in the message. The introduction identified patient names, treatment times, and treatment names.

Subjects were permitted no other materials except test booklets and pens or pencils. Although not specifically told to forego note-taking, the subjects had no means of taking notes unless they opened the test booklets and they were instructed not to do so. At the conclusion of the message, subjects were told to begin the test after reading instruction on the test booklet cover which advised them how to record their responses. Subjects were permitted as much time as needed to complete the test, but none required more than eight minutes.

Satisfaction of Assumptions

The next step was to determine whether assumptions were met for use of analysis of variance as an analytical tool, and, if so, which analysis type would be appropriate. Although such information is not normally included in research reports unless assumptions are violated, it is included here due to special issues in the choice of an analytical model for the data in this study.

Bartlett's test was used to check for homogeneity of variance.[43] This particular test was chosen because of the disproportionate cell frequencies. The test indicated satisfaction of the homogeneity assumption ($F = 10.8$, $p > .10$, $df = 7$). Cell variances and frequencies employed for this test are presented in Table 2.

Given the unequal n design, another relevant issue involved selection of an appropriate least squares method for analysis of variance. This study employed Type I analysis in the SAS-GLM procedure.[44] Since the nature of the

RRAT background distribution in this study assured unequal cell frequencies at the outset, the nonorthogonal condition of the design was not artificial. Under these circumstances, the method selected is appropriate for unequal n analysis.[45]

RESULTS

Type I analysis of variance yielded a significant effect for receiver apprehension ($F = 4.58$, $p < .034$, $df = 1,128$) and a significant message structure x recall structure interaction ($F = 4.05$, $p < .046$, $df = 1,128$). The message structure x recall structure x receiver apprehension interaction was not significant. Analysis for the model is summarized in Table 3.

Since the three-way interaction was not significant, a direct interpretation could be made for the apprehension effect. The marginal means for apprehension levels were 7.32 in the LA group and 6.03 in the HA group. Low apprehension receivers recalled more message information than high apprehension receivers.

Collapsing across apprehension level, the means for message structure/recall structure conditions were 6.81 in the PM/PR group, 5.89 in the PM/TR group, 6.37 in the TM/PR group and 7.83 in the TM/TR group. Post hoc analysis with the Duncan Multiple-Range Test[46] revealed that the TM/TR group scored significantly higher ($p < .05$) than the PR/TR group. No other comparisons were significant.

DISCUSSION

The results of this study were consistent with expectations for hypotheses one and two, but not for hypothesis three. A detailed discussion of outcomes relevant to each hypothesis follows.

Hypothesis One

The hypothesis of message structure x required recall structure was supported, but not in the precise form specified. The prediction was that

subjects in the PM/PR and TM/TR conditions would recall more than those in the PM/TR and TM/PR conditions. While the actual relationship among the means conformed to this prediction, the only significant comparison was TM/TR vs. PM/TR.

Nonetheless, the result is taken as supporting the basic position of the hypothesis that the superiority of a particular message structure is a function of the information-processing requirements of the task. A further analysis which divided HA and LA groups at the RRAT mean in order to include all study data yielded a much more pronounced interaction ($F = 6.40$, $p < .012$, $df = 1,228$) with means differing precisely as expected on significant comparisons (TM/TR = PM/PR > TM/PR = PM/TR).

As noted in the rationale, some studies employing concept and attribute category clustering schemes have suggested superiority of one over the other. This study does not support such a position where message structure is examined in light of recall structure. On the contrary, the efficacy of a particular message structure was dependent upon the nature of the task performed by the auditor. It appears that requiring a subject to use information in a task structure inconsistent with input structure disrupts the ability to process information from a cognitive structure created on input.

Hypothesis Two

Another purpose in this study was examination of the effect of receiver apprehension upon recall and the predictive validity of the RRAT. The hypothesis that low apprehension receivers would recall more message information than high apprehension receivers was supported. Wheeless has argued that receiver apprehension involves subjects' information-processing adequacy.[47] The results of this study appear to support that contention and lend evidence of predictive validity for the RRAT.

Although this finding is consistent with previous findings and the present conceptualization of receiver apprehension as presented by Wheeless and Scott, it leaves a key question unresolved which appears to be independent of the trait-state issue. Is information-processing performance actually affected by one's level of apprehension or is poor performance attributable to lack of adequate processing capabilities, with receiver apprehension being a product of one's awareness that these capabilities are lacking? Research on the relationship between apprehension and other organismic variables such as verbal organizing ability might clarify this issue.

Hypothesis Three

Given the absence of the predicted message structure x recall structure x receiver apprehension interaction, this study yielded no evidence which would directly support a trait conceptualization of receiver apprehension. Drive theory would predict such an interaction for trait anxiety and task complexity. Various studies of that problem area have produced results consistent with that theoretical expectation. The extension of drive theory to predict the same interaction for receiver apprehension appears logically sound if receiver apprehension is, in fact, a trait. As noted earlier, drive theory assumes that performance differences between high and low anxiety trait subjects occur through task-produced interfering response tendencies on the part of high anxiety subjects.[48] Child has argued that high anxiety trait subjects manifest competing responses associated with heightened anxiety as well as the experimental task.[49] In Child's view, then, anxiety <u>state</u> would be responsible for trait anxiety x task complexity interactions.[50]

While Spielberger has favored the drive theory view in interpretation of such interactions, he notes that Child's two-fold conception of competing response tendencies for high anxiety trait subjects may apply under more stressful circumstances where inferior performance for high anxiety subjects would be expected "even for the least difficult elements in the experimental task."[51] Given the presence of the apprehension main effect and absence of the three-way interaction in this study, an extension of Child's arguments to the receiver apprehension construct could possibly account for the results.

Had the three-way interaction been present, either view would support a trait conceptualization of receiver apprehension. They would differ only in the explanations provided for differences between high and low trait subjects on a complex task. Since this study did not assess the degree of stress present in the experimental situation nor the extent to which apprehension as a state might have been produced, interpretation for the absence of the three-way interaction is complicated. Assuming the possible presence of stress and the consequent state responses, Child's views would allow for a trait conceptualization of receiver apprehension. Drive theory would not necessarily permit such an interpretation.

It is clear that the present study does not resolve the Beatty, et al trait-state issue in connection with receiver apprehension. Additional research in this area might be directed toward revision of the research model to remove the limitations noted above. It might also be fruitful to examine the trait-state question for receiver apprehension in the same manner Beatty, Behnke, and McCallum employed for oral communication apprehension. It would be assumed in this approach that a trait is relatively stable and RRAT scores would be examined for such stability. It may well be that Wheeless and Scott have already

provided a thorough accounting for the issue by regarding receiver apprehension as a construct more closely aligned with fear than general anxiety as a trait.

FOOTNOTES

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[17]Richard F. Whitman, "An Investigation of Learning as a Function of Paragraph Structure and Verbal Organizing Ability," under review.

[18]Tom D. Daniels, "The Effects of Message Structure, Message Introduction, and Verbal Organizing Ability Upon Learning of Message Information," unpublished Ph. D. dissertation, Ohio University, 1979.

[19]While the concept and attribute structures reflect two different types of category clustering, previous research has created the same degree of structure in the two types through use of a category clustering index. The index = (R/(T -K)) x 100, where R = the number of consecutive repetitions of a concept (or attribute), T = the total number of sentences in the message, and K represents the number of categories. An index of 100% represents maximum unity.

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TABLE 1

Sample C x A Matrix

Attribute	Type	Enrollment	Program
Concept			
Daien Col.	Public	4,000	Polytechnic
Maxwell Col.	Private	1,700	Fine Arts
Ventner Col.	Parochial	2,500	Liberal Arts

In this matrix, concept names are represented in the form of college names. Type, enrollment, and program are attributes associated with the concepts. The matrix elements are attribute values. Sentences generated from the matrix relate attribute values to concept names and may be organized in categories by concept, by attribute, or in random order.

TABLE 2

Cell Means, Cell Frequencies, and Cell Variances

Cell	Frequency (n)	Mean	Variances
PM,PR,LA	15	8.00	18.57
PM,PR,HA	17	5.76	9.57
PM,TR,LA	15	7.07	13.50
PM,TR,HA	22	5.09	16.94
TM,PR,LA	21	6.52	6.46
TM,PR,HA	17	6.18	5.15
TM,TR,LA	15	8.00	10.57
TM,TR,HA	14	7.64	10.86

PM: message structured by patient
TM: message structured by time
PR: recall required by patient
TR: recall required by time
LA: low receiver apprehension
HA: high receiver apprehension

TABLE 3

Summary of Analysis of Variance

Source*	df	SS	MS	F	p
RA	1	52.21	52.21	4.58	.034
MS x RS	1	46.19	46.19	4.05	.046
MS x RS x RA	1	.15	.15	.01	.909
Error	128	1458.73	11.40		
				R^2 = .09	

*Other model effects are not pooled in this analysis. Pooling in this case would not have altered MS (Error).

Note. RA = Receiver Apprehension, MS = Message Structure, and RS = Required Recall Structure.